

Joint Dark Energy Mission (JDEM)
Project
Code 448

Telescope Concept Study
Payload Description

JDEM-TELE-REF-0010

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**National Aeronautics and
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Goddard Space Flight Center
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1.0 Introduction

This Payload Description Document provides information on the JDEM observatory for use by the contractor in their development of a telescope design for the JDEM Telescope Study. This study activity is intended to determine feasible telescope concepts and assess the critical thermal, optical, mechanical and dynamic environments that drive the JDEM telescope design. The study will also assess the critical cost, schedule, technical performance and risk drivers, develop cost and schedule estimates for the design, build and test of the telescope.

2.0 Reference Documents

At the website <http://jdem.gsfc.nasa.gov>, documents relating to this study are available for review and download.

JDEM-TELE-LEGL-0008	JDEM Project Telescope Concept Study Statement of Work
JDEM-TELE-REQ-0001	JDEM Project Telescope Concept Study Interface and Constraints Document
JDEM-SE-REF-0011	JDEM Project Math Models Guidelines Document

3.0 JDEM Concept Block Diagram

The draft concept for the JDEM payload, defined as the telescope, NIR instrument and fine guidance sensor (FGS), is depicted in Figure 3-1. The NIR instrument consists of three channels, the Visible NIR Imager (VNIRI) channel and 2 NIR spectrometer channels. The detailed optical prescription for the payload is provided in Section 6.0.

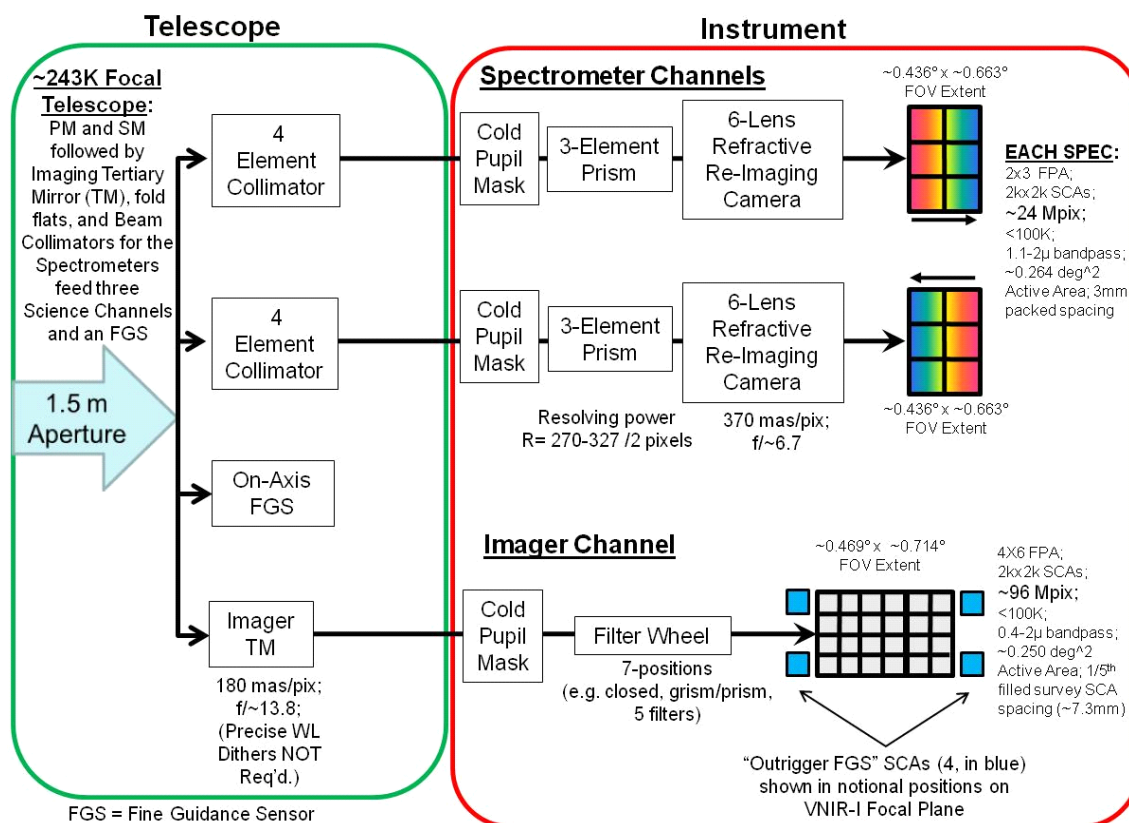


Figure 3-1 JDEM Concept Block Diagram (VNIR-I SCAs not to scale with NIR-S SCAs)

4.0 JDEM Concept Field of View (FOVs) at Telescope Intermediate Focus

The field of view of the JDEM NIR instrument and FGS at the telescope intermediate focus, based on the optical prescription provided in Section 7.0, is depicted in Figure 4-1. The current locations of the FGS detectors are notional. Final positions will be specified in the optical prescription.

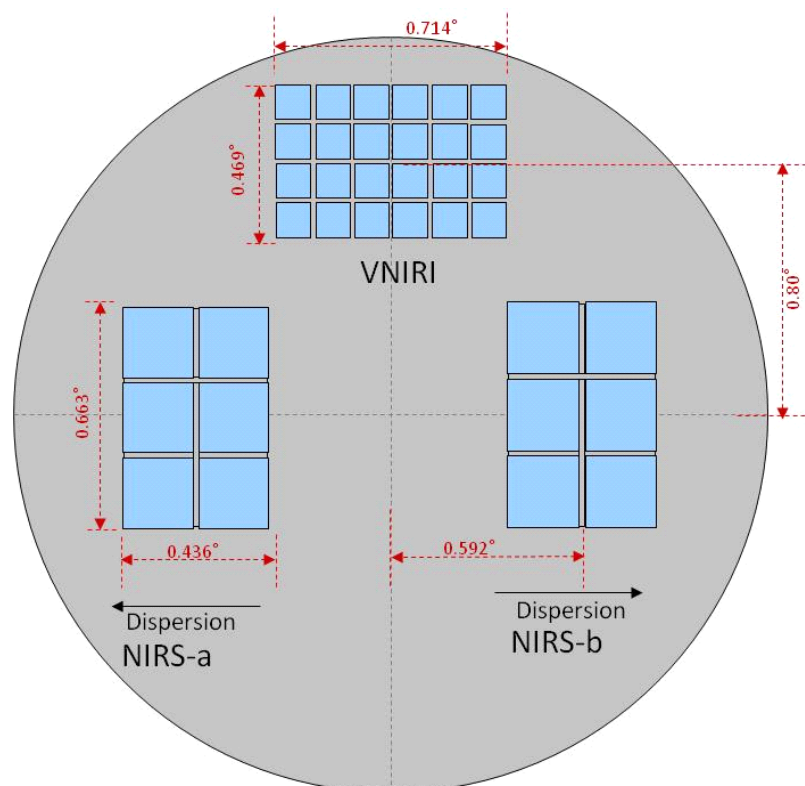


Figure 4-1 JDEM Concept FOV at Telescope Intermediate Focus (VNIR-I SCAs not to scale with NIR-S SCAs)

5.0 General Design Requirements

Table 5-1 summarizes the preliminary major JDEM telescope design requirements for accomplishing the current design reference mission. Detailed interface requirements and telescope design constraints will be provided in the Telescope Study Interface and Constraints Document.

Table 5-1 JDEM Telescope Design Requirements

JDEM Requirements	Value
Telescope Design	Three Mirror Anastigmat (TMA) with 3 tertiary mirrors
Aperture Size	1.5 m
VNIR Imager Channel (Telescope PM, SM and Optics Unique to the NIR Imager Channel and NIR Imager Diffraction Limit)	1 μm
Spectrometer Channels (Telescope Optics Unique to the NIR Spectrometer Channels and NIR Spectrometers Diffraction Limit)	2 μm
Telescope Optics Temperature	≤ 243 K
Total instrument Field of View	~ 0.86 sq. degree
Instrument F/#	NIR spectrometer f/6.7 NIR Imager f/13.8
Accessibility	Accessible Field Stop and Exit Pupil
Stray Light	$\leq 10\%$ minimum zodiacal light
Wavelength Range	0.4 μm – 2.0 μm
Telescope Collecting Area Obscuration	<15 - 30% (TBR)

6.0 Reference Mission Parameters

6.1 Orbit

The observatory shall be launched to an orbit around the Earth-Sun L2 point on an EELV (Atlas V, Delta IV, Falcon 9).

6.2 *Field of Regard*

The field of regard for WL and BAO observations shall be $+10^\circ$ (toward sun) to -30° (away from sun) pitch, $\pm 10^\circ$ in roll (around axis parallel to the telescope barrel) with no constraint on yaw. The field of regard for SN observations shall be within 10° of either the north or south ecliptic poles. Rolls of up to $\pm 45^\circ$ off the max power roll angle need to be tolerated such that a fixed inertial hold can be maintained for ~ 90 days.

7.0 Optical Prescription

Electronic optical prescription files in Zemax format and CAD model attached.